to the literature, all serving to bring the work up to date. It will continue to be a book which the plant physiologist and anyone interested at all in the chemistry of plant materials will want on his shelf.—S. V. EATON.

Soil alkali

HARRIS[5] has written an excellent critical little book on soil alkali. The author says: "It has been estimated that about 13 per cent of the irrigated land of the United States contains sufficient alkali to be harmful. This means that there are over 9,000,000 acres of land under present canal systems that are affected with alkali. There are many more million acres of alkaline land in the United States that do not lie under irrigation systems. Similar figures might also be given for other countries of this continent and for all other continents. The alkali problem is one of no mean importance to farmers, nor to any who are interested in the world's food supply.

In a strictly chemical sense the word alkali refers to a substance having a basic reaction. As applied to the soil, however, this restricted meaning does not hold, and alkali refers to any soluble salts that make the soil solution sufficiently concentrated to injure plants. This includes the chlorides, sulphates, carbonates, and nitrates of sodium, potassium, and magnesium, and the chloride and nitrate of calcium. The sulphate and carbonate of calcium are not sufficiently soluble to be injurious to crops. Most of the alkalies are in reality neutral salts. It may be somewhat unfortunate to use for general substances a word that has become so well established in agricultural literature that it would now be very difficult to change it." The author also emphasizes the great number of purely scientific problems connected with alkali soils and the need of much fundamental research in this field.

The book includes 16 chapters: 1. Introduction; 2. Geographical distribution; 3. Origin of alkali; 4. Nature of alkali injury to plant; 5. Toxic limits of alkali; 6. Native vegetation as an indicator of alkali; 7. Chemical methods of determining alkalis; 8. Chemical equilibrium and antagonism; 9. Relation of alkali to physical conditions in the soil; 10. Relation of alkali to biological conditions in the soil; 11. Movement of soluble salts through the soil; 12. Methods of reclaiming alkali lands; 13. Practical drainage; 14. Crops for alkali land; 15. Alkali water for irrigation; 16. Judging alkali land.—WM. CROCKER.

NOTES FOR STUDENTS

Vegetation of Tasmanian mountains.—In reporting in some detail a study of the mountain vegetation of Tasmania, Miss GIBBS[6] sketches the position of the geological history of the island that most directly concerns its

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[5] HARRIS, F. S., Soil alkali, its origin, nature, and treatment. pp. xvi+258. Wiley & Sons. 1920.

[6] GIBBS, L. S., Notes on the phytogeography and flora of the mountain summit plateaux of Tasmania. Jour. Ecol. **8**:1–17, 89–117. 1920.

present vegetation. The present area of 27,000 sq. mi. seems to have been much reduced during the latest glacial period, subsequent to its separation from Australia, now 184 miles distant. Its vegetation during that period consisted probably of moss and low shrubs only. As its present configuration comes from the dissection of one huge plateau, there are within the island no important barriers to migration, and the elevations do not exceed 5000 ft. The annual rainfall varies from 112 to 165 inches, while high winds are incessant upon the more elevated portions.

The *Eucalyptus* forests of the lowlands, the mixed forest of the west coast, and the vegetation of the tablelands and mountains constitute the three main plant formations of the island. These formations with their main subdivisions are briefly characterized, but only the higher elevations are considered in detail, and their vegetation is regarded as austral-montane rather than alpine. The higher plateaus range from 3500 to 4000 ft. in altitude, with a few rock masses higher. There are no glaciers or permanent snow fields, although during the winter months the mountains are often snow-covered, and this, together with heavy rains during the rest of the year and persistently high winds, constitutes a fairly rigorous climate, which results in a vegetation that is shrubby and spreading in habit, with small coriaceous leaves, and almost wholly without herbaceous forms except on the highest peak, where the snow remains late in the season. There a mosaic of low mosslike plants is developed, the individuals often taking the form of cushions.

Shrub associations dominate the more exposed plateau summits. Here the vegetation reaches a height of 1–1.5 m., and is decidedly xerophytic in aspect, showing rigid branching, small evergreen leaves, and often terminal flower clusters. These shrub associations vary from a very scattered display upon broken rock to dense masses with a well developed undergrowth where soil conditions are more favorable. Usually there is no massing of a single species, but several mingle freely. In one situation the endemic *Microcachrys* formed a dense green carpet for yards around well isolated groups of *Diselma Archeri*, *Podocarpus alpina*, *Coprosoma nitida*, and *Olearia pinifolia*. Other abundant genera are *Orites*, *Richea*, *Bauera*, *Epacris*, and *Helichrysum*. At somewhat lower altitudes the shrubs pass into the dwarf montane forest, one type of which consisted of trees like *Phyllocladus aspleniifolius*, *Arthrotaxis selaginoides*, *A. laxifolia*, and *Atherosperma* crowded together with shrubby *Diselma*, *Orites Milligani*, *Fagus Gunnii*, *Drimys aromatica*, *Telopea*, *Tetracarpaea*, and *Richea pandanifolia*, all about 2 m. in height. In more sheltered situations these forests reach a height of 3–5 mi., and may pass to *Eucalyptus* scrub.

The conditions of low temperature, intense illumination, with high winds and heavy rainfall, here limited to high altitudes, in the antarctic region are found at sea level and result in similar vegetation; hence it is not inappropriate to apply the term "antarctic" to this montane flora. The practical absence of annual leaf fall, and the entire absence of leguminous plants which act as

nitrifying agents, are considered responsible for the lack of progressive improvement of soil conditions and the persistence of xerophytes. The same factors account for the relative absence of herbaceous plants. In seeking for the origin of this flora, after an examination of the available evidence, Miss GIBBS concludes that the mountains of New Guinea may be considered as the focus of development and distribution of the so-called "antarctic" plants, justifying the term Papuan austral-montane for this group, of which, even on the limited basis of our present knowledge, nearly one-half of its most characteristic genera are now known from New Guinea. The author also contends that the northwesterly poleward wind which sweeps persistently over the mountains of New Guinea above tree level, in a constant direction and at a constant altitude, decreasing in height in its progress southward, is the agency by which this flora has been transported. Once established, the elements remain within the radius of the lower but equally constant circumpolar wind.

Collections from these montane associations show 108 species of vascular plants, of which 67 are endemic, the most remarkable family being the Coniferae with 7 genera and 9 species, 3 genera and 8 species being endemic. Other large families are the Proteaceae with 8 species, all endemic, the Myrtaceae with 5 species, 3 being endemic, the Epacridaceae with 20 species, of which 16 are endemic, and the Compositae with 19 species, 12 being endemic. Among families well represented in boreal montane regions, but much less conspicuous in Tasmania, are the Cyperaceae, Ranunculaceae, Cruciferae, Rosaceae, and Ericaceae, each represented by only a single species.—GEO. D. FULLER.

Aluminum and soil acidity.—MIRASOL[7] has done a piece of work on the relation of aluminum to soil acidity, working on three different acid silt loams from southern Illinois. "In the absence of some calcium compounds as a source of calcium, aluminum salts were highly toxic to sweet clover when applied in amounts chemically equivalent to five times the acidity of the soil. In the presence of calcium silicate, aluminum nitrate was more toxic than aluminum sulphate. . . . . Aluminum mono-hydroxide did not have any effect on sweet clover when other plant food elements were added in the soluble form. Calcium carbonate in sufficient amount corrected the toxicity of aluminum salts, by precipitating aluminum as calcium aluminate, an insoluble compound. Acid phosphate applied at the rate of 400 pounds per acre reduced the toxicity of aluminum salts by forming aluminum phosphate, an insoluble compound." Like HARTWELL and PEMBER, in an article recently reviewed in this journal, MIRASOL found that acid phosphate precipitates soluble aluminum, but in contrast to these investigators he found that acid phosphate decreases the acidity rather than increases it as they had assumed. "The form of aluminum immediately concerned in the unproductivity of acid soils in the soluble form is the salts. . . . . In soils sufficiently provided with calcium,

[7] MIRASOL, J. J., Aluminum as a factor in soil fertility. Soil Science **10**:153–193. 1920.